6.7/37 car decelerates uniformly (constant) from 55 mph to 25 mph in 30 seconds

Find its acceleration [which will be negative of course]

$a(t) = \underline{D}$ mi/hr^2

$v(t) = \int D\,dt = Dt + V_0$

$v(0) = D(0) + V_0 = 55$

$\therefore v(t) = Dt + 55$

$v\left(\frac{1}{120}\right) = D\left(\frac{1}{120}\right) + 55 = 25$ from problem

30 seconds means

$t = \frac{30 \text{ sec}}{3600 \frac{\text{sec}}{\text{hr}}}$ hrs. from problem

$t = \frac{1}{120}$

$\frac{D}{120} = -30$, $D = -3600 \frac{\text{mi}}{\text{hr}^2}$

but we want fps^2

$$\frac{-3600 \text{ mi}}{(\text{hr})^2} \cdot \frac{\text{hrs}^2}{(3600)^2 \text{sec}^2} \cdot \frac{5280 \text{ ft}}{\text{mi}}$$

$= -1.467$ ft per sec^2

$a(t) = f(t)$

$v(t) = \int f(t)\,dt \;(+C)$

Jan 14-7:36 AM

6.7/35)

$\rightarrow 25\text{cm/sec} = v_0$

0

$0 \le t \le 4$ $a(t) = 0$, $v(t) = -25$, $x(t) = -25t + x_0$ $+0$

$t > 4$ $a(t) = -10$ cm/sec/sec

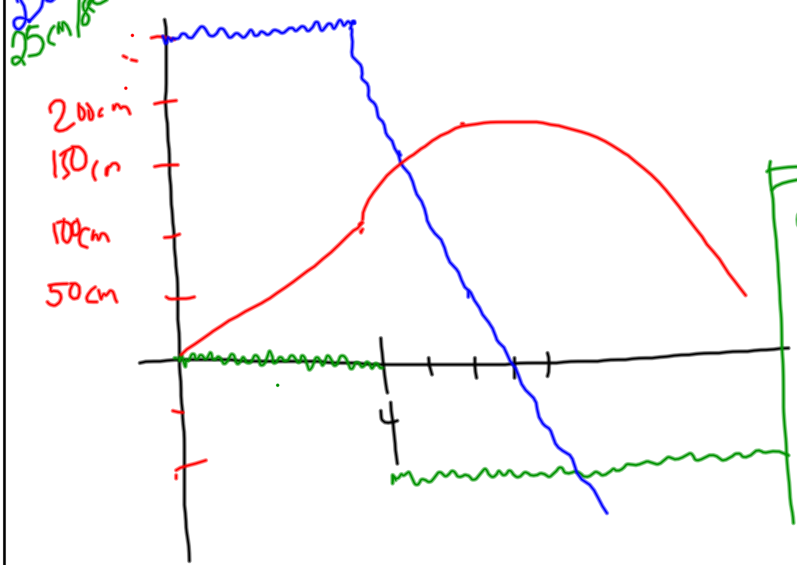
$v(t-4) = \int -10\, dt = -10t + v_0$

$= -10t + 25$

$x(t-4) = -5t^2 + 25t + 100$

$x(t-4) = \int -10t + 25\, dt$

$= -10\frac{t^2}{2} + 25t + C$



d) max x?

$\frac{d}{dt}(x(t)) = -10t + 25$

$= 0$

$t = \frac{25}{10} = \frac{5}{2}$

$[t + 4]$

6.7/38

60 mph . . . . 45 mph

$a = -10 \frac{ft}{sec^2}$

chg units
mph → fps

$\frac{60 \text{ mi}}{\text{hr}} \cdot \frac{5280 \text{ ft}}{\text{mi}} \cdot \frac{1 \text{ hr}}{3600 \text{ sec}} = 88 \text{ fps.}$

$\frac{45 \text{ mi}}{\text{hr}} \text{ . . . . } = 66 \text{ fps.}$

so $a = -10 \Rightarrow v(t) = -10t + v_0$

$v_0 = 88$ fps so

$v(t) = -10t + 88$ t in SECONDS

solve for t:

$-10t + 88 = 66$

$-10t = 66 - 88 = -22$

$t = 2.2$ seconds

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$v(t) = -10t + 88$ t in seconds

solve for t:

$v(t) = 0$

$-10t + 88 = 0$

$-10t = -88$

$t = \frac{-88}{-10} = 8.8$ seconds

Jan 14-8:17 AM

Find

$$\int x(3x^2+7)^{40}\,dx \Rightarrow \int (u)^{40}\left(\tfrac{1}{6}du\right)$$

Let $u=3x^2+7$

$du=6x\,dx$

$\frac{1}{6}du=x\,dx$

[headed for power rule]

$$=\frac{1}{6}\left(\frac{u^{41}}{41}\right)+c$$

$$=\frac{(3x^2+7)^{41}}{246}+c$$

$\sin^7 x = (\sin x)^7$

$$\int \sin^7 x\,\underline{\cos x\,dx}$$

$u=\sin x$

$du=\underline{\cos x\,dx}$

$$\int (u)^7\,du=\frac{1}{8}u^8+C$$

$$=\frac{1}{8}(\sin x)^8+C$$

$$\int \frac{(\ln x)^4}{x}\,dx \Rightarrow \int u^4\,du$$

$$=\frac{u^5}{5}+c=\frac{(\ln x)^5}{5}+C$$

$u=\ln x$

$\frac{du}{dx}=\frac{1}{x}$

so $du=\underline{\frac{1}{x}dx}$

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$$\int_{1}^{3} x(3x^2+7)^{40}\,dx$$

these are limits of the variable x

Let $u=3x^2+7$

$du=6x\,dx$

$\frac{1}{6}du = x\,dx$

When $x=1$, $u=3(1)^2+7=10$

when $x=3$, $u=3(3)^2+7=34$

$$\int_{x=1}^{x=3} \cancel{u^{40}\frac{du}{6}}$$

$$\frac{1}{6}\int_{10}^{34} u^{40}\,du$$

$$= \frac{1}{6}\cdot\frac{u^{41}}{41}\Big|_{10}^{34}$$

$$= \frac{(3x^2+7)^{41}}{246}\Big|_{1}^{3}$$

$=$